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GENERIC NOMENCLATURE.

C. L. SHEAR.

THE application and limitation of generic names is a subject which has lately received considerable attention, not only from botanists, but from systematic biologists in general. Efforts to secure at least a degree of uniformity and stability in the use of scientific names have become more general in recent years, and quite naturally have been directed chiefly to specific designations. To one who will give the matter careful consideration, however, it must appear clear that the stability of the generic name is of primary importance, and must be secured before we can hope for stability of the binomial. I am aware that questions of nomenclature are considered beneath the notice of some botanists, especially some of those whose fields of labor do not bring them into very close contact with taxonomy; but there is no student of plant life in any of its multidudinous phases but must have occasion at some time to use plant names, and hence should be interested to some degree, at least, in any sincere effort to secure stability and uniformity in nomenclature.

Personally, I have long tried to avoid and evade the subject, believing that too great importance was attributed to it; and I am still far from regarding it as an equivalent for biological research; but having undertaken some taxonomic work, I found myself confronted by certain questions that must be decided.

The present discussion of this subject relates especially to the fungi, as I have made no special investigation of the conditions prevailing in any other group except the grasses.

To one who has never had occasion to trace the origin and history of a generic name through literature, it may appear that there is very little diversity in the application of such names, but a careful comparison of the use and interpretation of generic names by different authors soon reveals the fact that each followed his favorite author or his individual preference or conception, which is not always based upon any serious consideration of the consequences, and leads naturally to little uniformity. An abundance of instances verifying this statement might be cited, but we shall take space to refer to only a few. Let us glance first at one or two of the older genera. Take for example the genus *Lycoperdon*. So far as we know, the name was first used by Tournefort,[1] who gave brief descriptions of twenty-eight species, including a considerable variety of Gasteromycetes. His plate illustrating the genus represents four species, two of which belong to the present genus as interpreted by DeToni.[2] The two others belong to distinct genera. It would require too much space to trace the entire history of the genus as interpreted by different authors down to the present time. Michelius[3] and most other authors until Linnæus used the name in much the same sense as Tournefort. Linnæus,[4] in *Genera Plantarum*, greatly enlarged the scope of the genus, and included many things previously separated by other authors. Interpreting his idea of the genus by the species referred to it in *Species Plantarum*, we have a very heterogeneous collection. Of the nine species described by him, but one is found in the genus as interpreted in Saccardo,[2] and even that one is not included by some recent authors. Myxomycetes, Ascomycetes, and Uredineæ are represented among Linnæus' species. Postlinnæan authors vary in their interpretation of the genus, and also as to whom it should be credited. The conceptions of Tournefort and Michelius, as shown in their illustrations of species, have apparently exercised the greatest influence, and have led to the present more or less general interpretation of the genus. The present application of the name is the natural outcome of following what might be called the lines of least resistance, which has lately been designated the "residue method," but was at first really no conscious method at all.

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[1] TOURNEFORT, Ins. Rei Herb. 1 : 563. *pl. 331.* 1700.

[2] DETONI, Saccardo Syll. Fung. 7 : 106. 1888.

[3] MICHELIUS, Nov. Pl. Gen. 217. 1729. [4] LINNÆUS, Gen. Pl. 328. 1737.

The genus *Agaricus* affords another interesting example established by Tournefort,[5] who referred to it chiefly species of *Polyporus* in the sense of Saccardo, and figured as representing his idea of the genus, *Polyporus fomentarius* (L.) Fr. It was later taken up by Dillenius[6] and also Linnæus,[7] who referred to it chiefly lamellate forms. Since, the genus has been divided and subdivided until the name has become entirely displaced or relegated to a few imperfectly described species which could not be definitely referred. Karsten, Patouillard, and Saccardo[8] have applied the name to a group of species, including the common mushroom, *Agaricus campestris* L. But why should it be retained for this group rather than for any of the dozen or more groups to which it had equal claim? If any reason were given, it would probably be that this was the best known group, containing the species which has long been grown and collected for food.

The history of the genus *Sphaeria* Haller[9] is also very interesting, and shows how names are entirely displaced, or relegated to groups of insufficiently described species or indeterminate odds and ends of old authors.

Lest it should be inferred that such *laisser faire* proceedings are characteristic of the older authors only, we may call attention to one or two modern instances. Take the genus *Valsaria* Ces. & De Not.,[10] for example. Four species were positively referred to the genus and five others doubtfully by these authors. Later De Notaris[11] described and referred to the genus two more species, the last of which was *V. tiliae.* Now note the treatment of this genus by two recent authors, Saccardo[12] and and Lindau.[13] Saccardo included most of the species originally referred to the genus by its authors and added a considerable number of others. Lindau cites De Notaris as the sole author of the genus, and restricts it to two species, only one of which is mentioned, *V. tiliae*, which was referred to the genus by De Notaris (*l. c.*), but was not included in it by the original authors, and was soon after taken as the type of the genus *Hercospora* by Tulasne.[14] It is scarcely worth while to multiply examples; any one who cares to look into the matter will find them without difficulty and in endless variety. For some cases of a similar sort among genera of ferns consult Underwood.[15]

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[5] TOURNEFORT, Ins. Rei Herb. 1:562. *pl. 330.* 1700.

[6] DILLENIUS, Nov. Gen. 75. 1719.

[7] LINNÆUS, Gen. Pl. 327. 1737.—Sp. Pl. 2:1171. 1753.

[8] SACCARDO, Syll. Fung. 5:993. 1887.

[9] HALLER, Hist. Stirp. Helv. 3:120. 1768.

[10] CESATI and DE NOTARIS, Schem. Sfer. Ital. Asc. in Comm. Crit. Soc. Ital. 1:205. 1863.

[11] DE NOTARIS, G., Sfer. Ital. 57. 1863. This was published nearly a year after the last publication cited. The preface to fasc. 2, in which the above citation occurs, is dated December 1863, while the Schem. Sfer. Ital. is referred to in the preface to fasc. 1 which is dated March 1863, indicating that it appeared earlier in the year.

It has been urged that instances of this kind are exceptional, but any one who takes the trouble to investigate the matter will find that they are exasperatingly frequent among the fungi, and I am told by those who have investigated the matter that the case is practically the same in other groups. The instances in which old generic names have been entirely displaced or transferred to different plants from those originally included are most numerous, and arise generally from the lack of uniformity in the subdivision or segregation of large or composite genera. A genus is divided into several subgenera, these are in turn raised to generic rank, the original name being entirely displaced or left with an undeterminable or miscellaneous residue, which the original author never included in it or at least did not regard as typical.

The first attempt, so far as we know, to formulate any rule for guidance in the segregation of large or composite genera was that of the Paris code, article 54 of which reads as follows:

> Lorsqu'un genre est divisé en deux ou plusieurs, le nom doit être conservé et il est donné à l'une des divisions principales. Si le genre contenait

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[12] SACCARDO, Syll. Fung. **1**: 741. 1882.

[13] LINDAU, Eng. and Prantl Pflanzenfamilien I. **1**: 470. 1897.

[14] TULASNE, L. R. & C., Sel. Fung. Carp. **2**: 154. S 1863.

[15] UNDERWOOD, L. M., Rev. Gen. Ferns, Mem. Torr. Bot. Club **6**: 251 and 279. D 1899.

une section ou autre division qui, d'après son nom ou ses espèces, était le type ou l'origine du groupe, le nom est réservé pour cette partie. S'il n'existe pas de section ou subdivision pareille, mais qu'une des fractions détachées soit beaucoup plus nombreuse en espèces que les autres, c'est à elle que le nom doit être réservé.

This rule is so indefinite, and requires so much in the way of personal interpretation and judgment, that it has not produced uniform results in the hands of those who have sincerely attempted to use it as a guide. Kunze,[16] recognizing the impossibility of securing uniformity under this rule, proposed a modification of it which should make it more definite. As no particular period in the history of a genus is designated to be taken as a basis for applying the Paris code rule, Kunze very aptly remarks that it leaves us "über die höchst wichtige Frage im Unklaren." He emended this article so that it should require the generic name to be applied to the majority of the species included in the genus at the time of its valid establishment.

This has been designated the "species majority" method. While Kunze's amendment is a decided improvement, it is still incapable of giving us stability and uniformity in the application of generic names.

In the first place, it does not provide for the cases in which but two species were originally referred to a genus, either of which may be equally entitled to retain the name when the genus is divided. The fatal difficulty, however, is that the selection of the species which are to be considered as belonging to the genus must be based upon the reviser's conception of the genus, or upon the conception of the author that he may choose to follow, and it is quite unnecessary to call attention to the great diversity of generic concepts which has obtained, and still obtains, among botanists.

The Rochester rules make no direct provision for the treatment of genera, but refer all questions not particularly provided for to the Paris code.

The so-called "residue method" is the one which has been most generally accepted by adherents to the Rochester rules. I have

[16] KUNZE, O., Rev. Gen. Pl. 1: XCII. 1891.

long sought in vain for an authoritative statement of this method, but have until very recently been unable to learn of any attempt to formulate it. Thanks to Dr. Underwood,[17] who has bravely attacked the problem of generic types, we have the following statement: "The method of 'residues' works on the principle that the last species remaining in the genus from those originally named by its author when the genus was founded shall constitute the type of the genus and shall hold the generic name."

The fatal objection to this and to the other methods is that, being capable of and depending upon the varied interpretation by different authors, it cannot lead to uniformity. Besides this there are many instances in which several genera, each containing a number of species, were established at nearly the same time, which make it impossible to adjust generic limitations by means of this method.

The fundamental failing of all these plans is that the generic name remains movable, and is capable of being shifted about from one end of a series of species to the other, these species frequently representing different genera and sometimes families. As Dr. Jordan[18] aptly puts it: "These methods have lacked the one important element of inevitableness." The first and fundamental step to be taken is to fix generic names at one point by means of an assigned type, in case none was originally designated by the author. This method has already been proposed by Cook,[19] and also by Underwood, *l. c.* We can scarcely expect to secure entire uniformity in generic limitations, as various authors naturally differ in regard to the scope of genera, but if some practicable method can be devised for anchoring generic names at fixed points, we shall always know where to find at least the nucleus of the genus, however much it may have been enlarged or contracted since its origin.

The type method in regard to species has gained general recognition so far as present practice is concerned, though we regret to say that one still occasionally sees new species described without the citation of a type specimen. The type method is equally or even more necessary and applicable in the case of genera; but admitting the advisability and possibility of such a method the details still remain to be arranged. Cook, *l. c.*, has discussed the question in general; Underwood, *l. c.*, has formulated a set of rules for fixing types and applied them to the genera of ferns; Jordan, *l. c.*, has also recently given us his views regarding the matter.

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[17] *Op. cit.*, 252. [18] JORDAN, D. S., Science N. S. **13** : 499. 29 Mr 1901.

[19] COOK, O. F., Science N. S. **8** : 186-190. 12 Ag 1898; 513-516. 14 O 1898.

It seems very desirable and important that this matter should be thoroughly investigated and discussed before any fixed plan is adopted for putting the method into practice.

The essential features of any rule should be simplicity, clearness, and comprehensiveness. Rules which require or give opportunity for personal choice or interpretation cannot lead to uniform results. Provision should be made for all classes of cases involved, and this necessitates a thorough knowledge of all taxonomic literature. To one not familiar with the great diversity of practice among the botanists of the eighteenth century, the brief rule, "the first-named species of each genus shall be regarded as its type," would seem to fulfill all the requirements mentioned above. But would "the first-named species" apply to both polynomial and binomial species? And what would become of a genus whose author never referred to it a binomial species, but cited good figures of polynomial species? Rules will also have to be modified according to the time taken as a starting point for genera. The present starting point of the Rochester rules, 1753, seems very illogical and unsatisfactory for genera, and we believe will eventually be abandoned.

Let us examine briefly the various plans already proposed for the fixing of types. Mr. Cook, who was one of the first to propose the type method, has published no formal statement of rules, but says that genera should be fixed "by confining the application of a generic name to the genus in which its assigned type or first binomial species is included." Whatever the starting point might be this would require that genera established by polynomialists should be interpreted by their first successor using their generic names with binomial species. Thus, in the case of Haller,[9] this plan would lead to the application of his generic names to different groups from those to which they would be applied by taking his first species as a type. It may be the intention, however, to disregard the genera of polynomialists entirely, as well as all those based upon descriptions not accompanied by direct citation of binomial species.

Dr. Underwood, *l. c.*, has formulated a series of rules and made a practical application of them. He adopts 1753 as his starting point, and designates what are to be regarded as valid genera as follows: "(*a*) based on one or more previously described species which are referred to with sufficient directness to be recognizable, or (*b*) based on some species which is described for the first time at the establishment of the genus itself."

For the selection of types the following rule is given: "For each genus established, the first named species will be regarded as the type." Two exceptions to this are made. One is that Linnæan genera must be traced to their types wherever they originated, and "in case the original generic name was used in another sense than that which it was adopted by Linnæus, the the type of the genus in the Linnæan sense must be determined wherever it was first used." The other exception covers cases in which "a definite statement of the type" is made by the author of the genus.

The application of these rules leads to entirely different results from those which would be reached by following Mr. Cook's plan. The difference is due in great part to the manner in which Dr. Underwood determines the types of Linnæan genera. Adopting 1753 as a starting point, and then selecting types for genera from Linnæus's earlier work, appears rather illogical. If types are to be taken from works earlier than 1753, why not date them accordingly? There also seems to be need of more definite provisions for determining the types of such genera as those of Adanson,[20] which are accepted by Underwood but do not appear to be interpreted according to any rigid rule.

[20] ADANSON, Fam. Pl. 1763.

We fear that other authors, attempting to follow these rules in an entirely unprejudiced manner, would not arrive at the same results. This, however, is distinctly an effort in the right direction, and due credit should be given for it.

Dr. Jordan, *l. c.*, in connection with his excellent review of the subject, suggests provisional rules for applying the type method. His rule 2, which covers the principal points at issue, is as follows: "If no type is designated by the author, either explicitly or by clear implication, then the first species referred to the genus or the species standing first on the page shall be considered as its type. A generic name should have no standing if resting on definition alone, nor until associated with some definite species."

With the exception of the expression "or by clear implication," this rule comes nearest to meeting the requirements for simplicity, clearness, and comprehensiveness. The phrase referred to, however, as well as several exceptions which the author adds, seems to present very undesirable opportunities for the exercise of personal opinion and choice, which are so fatal to uniformity.

It is not our intention to attempt to offer a set of rules which shall be perfect, and meet all the requirements of the case, but simply to avow our belief in the desirability and practicability of the type method, and to point out some of the matters which should be given careful consideration and investigation before any rules are generally adopted.

Of primary importance in this connection is the selection of a starting point for genera which may meet with general acceptance.

Definite provision should also be made for the treatment of genera having no binomial species referred to them at the time of their original description. It seems scarcely just to discard a generic name because it happened to originate with a polynomialist (*e. g.*, Haller, to cite a case after 1753), or in cases like that of Adanson, *l. c.*, when definite figures of identifiable species are cited instead of specific names, It is to be hoped that careful consideration and study will be given to all the different phases of this subject, and that it will be thoroughly discussed from all points of view in order that any authoritative action in the way of formulating rules which may be taken may fully meet the requirements of the case and not prove premature.

WASHINGTON, D. C.